

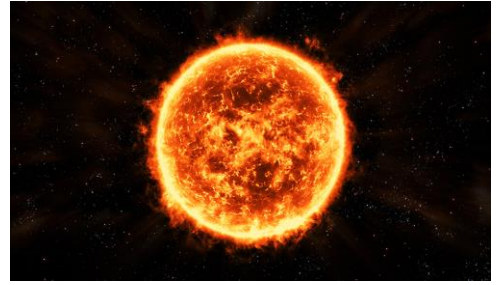


Parcham Classes

SOLAR SYSTEM


THE SUN

- The Sun is composed of hydrogen (70%) and Helium (28%).
- The energy created by the Sun's core is nuclear fusion
- ISRO categorises Aditya L1 as a 400 kg-class satellite, that will be launched using the Polar Satellite Launch Vehicle (PSLV) in XL configuration
- NASA LAUNCHED 'PARKER SOLAR PROBE'



THE PARKER SOLAR PROBE

A Journey to the Sun



The Probe

The Sun

Mission: To expand our understanding of the Sun and collect data that could contribute to our ability to forecast space-weather.

Run by: NASA

Objectives:

- Study the flow of energy and the heating of the Sun's corona
- Figure out what causes the acceleration of solar wind
- Explore the structure of magnetic fields and plasma

Scientific Goals:

- The **FIELDS** suite - measures magnetic and electric fields around the craft
- The **WISPR** instrument - an imager that will take images of coronal mass ejections
- The **SWAP** suite - record data pertaining to the particles in solar wind
- The **ISOIS** suite - measures particles to help determine how they got accelerated

Special Notes:

The mission is named after Eugene Parker who wrote a paper in 1958 theorizing the existence of solar wind. This is the first NASA mission to be named after a living person.

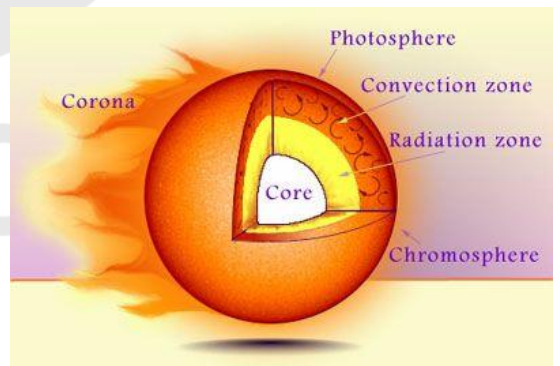
Mission Timeline:

<p>2018</p> <p>August 6: Launch</p> <p>September 24: Venus Flyby #1</p> <p>November: Perihelion #1</p>	<p>2021</p> <p>January 13: Perihelion #7</p> <p>February 16: Venus Flyby #4</p> <p>April 24: Perihelion #8</p> <p>August 5: Perihelion #9</p> <p>October 13: Venus Flyby #5</p> <p>November 16: Perihelion #10</p>	<p>2023</p> <p>March 13: Perihelion #15</p> <p>June 25: Perihelion #20</p> <p>September 24: Perihelion #21</p> <p>December 26: Perihelion #18</p>
<p>2019</p> <p>March 21: Perihelion #2</p> <p>August 24: Perihelion #3</p> <p>December 22: Venus Flyby #2</p>	<p>2022</p> <p>February 21: Perihelion #11</p> <p>May 24: Perihelion #12</p> <p>September 1: Perihelion #13</p> <p>December 6: Perihelion #14</p>	<p>2024</p> <p>March 25: Perihelion #19</p> <p>June 25: Perihelion #22</p> <p>September 24: Perihelion #23</p> <p>November 23: Venus Flyby #7</p> <p>December 16: Perihelion #22</p> <p>First Close Approach</p>
<p>2020</p> <p>January 24: Perihelion #4</p> <p>June 2: Perihelion #5</p> <p>July 6: Venus Flyby #3</p> <p>September 22: Perihelion #6</p>		<p>2025</p> <p>March 18: Perihelion #23</p> <p>June 18: Perihelion #24</p>

STRUCTURE OF THE SUN

The Sun has six regions.

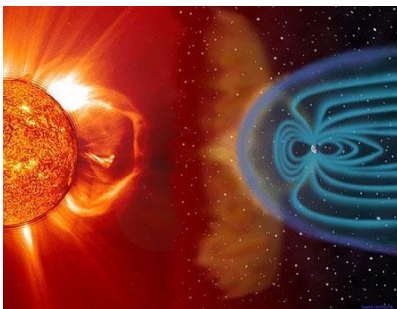
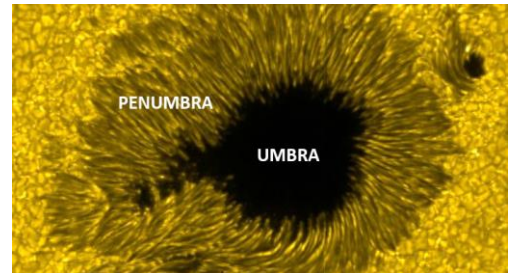
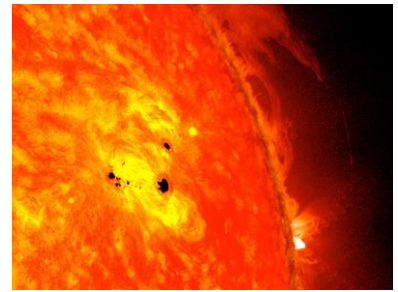
1. The sun has a **Core** at its center,
2. A **Radiative zone** surrounding the core,
3. A **Convective zone** surrounding the radiative zone,
4. A thin **Photosphere** at its surface
5. A **Chromosphere** and
6. **Corona** that extends beyond the photospheric surface.



- At the core, the temperature is about 27 million degrees Fahrenheit (15 million degrees Celsius), which is sufficient to sustain thermonuclear fusion.
- Energy produced in core slowly rises in the radiative zone outside the core.
- The transport of energy from the Sun's core (where it is produced) to the regions that surround it can be done by transferring it by radiation. This is how it travels from the center of the Sun to the outer regions, hence the name "radiative zone".
- The photosphere is the bright outer layer of the Sun that emits most of the radiation.
- Chromosphere is relatively a thin layer of burning gases.
- Corona is a thick layer of gas above chromosphere. It extends millions of kilometers around the sun. Sun's Corona visible during Total Solar Eclipse.

SUNSPOT

- A dark patch on the surface of the Sun is known as a sunspot.
- Sunspots are areas of the Sun's surface that appear darker than the surrounding areas, this is because they are cooler. They form in areas of strong magnetic activity that inhibit heat transfer.
- Sunspots are 500-1500°C cooler than the surrounding chromosphere. That is the reason that they appear as dark areas.
- Each spot has a black centre or umbra, and a lighter region or penumbra, surrounding it.



SOLAR WIND

- The solar wind is a stream of **energised, charged particles**.
- It flows outward from the Sun.
- The earth's magnetosphere acts as a shield against the ever growing solar wind and deflect it away from the Earth.
- Particles of solar winds sometimes pierce the magnetic shield and enter the upper atmosphere. This causes Auroral displays.
- In Arctic region they are called **Aurora Borealis** and in Antarctic region there known as **Aurora Australis**.

Parcham Classes

CONDITIONS TO BE A PLANET

- ❖ The most recent definition of a planet was adopted by the International Astronomical Union in 2006. It says a planet must do three things:
- ❖ It must orbit a star (like the Sun).
- ❖ It must be big enough to have enough gravity to force it into a spherical (or nearly spherical) shape.
- ❖ It must be big enough that its gravity cleared away any other objects of a similar size near its orbit around the Sun.

INTERNATIONAL ASTRONOMICAL UNION (IAU)

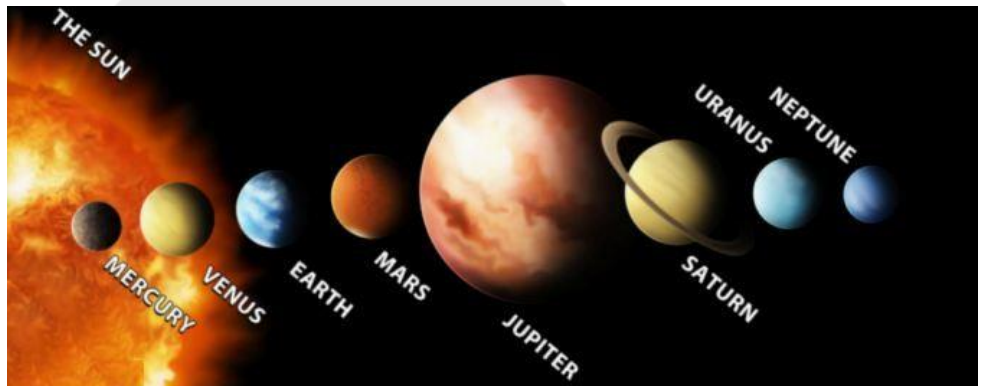
- **Established** : in 1919
- **Headquarters** : Paris, France
- **Role** : to promote and safeguard the science of astronomy through international cooperation, assign official names and designations to celestial bodies.



PLANETS OF THE SUN

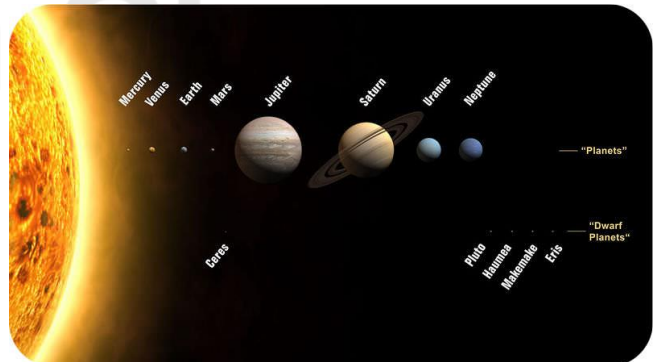
The 8 planets of the Sun are :

1. Mercury,
2. Venus,
3. Earth,
4. Mars,
5. Jupiter,
6. Saturn,
7. Uranus and
8. Neptune.



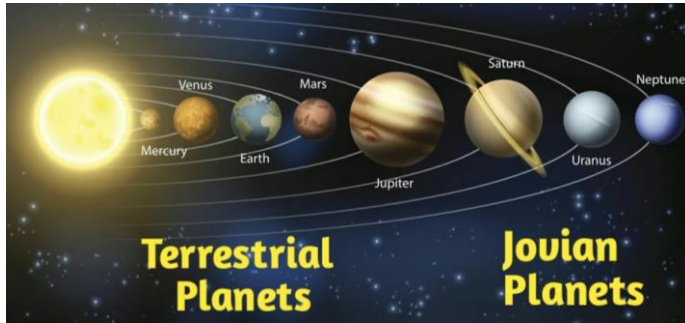
DWARF PLANETS

- In 2006, a new and distinct class of celestial objects was named by the International Astronomical Union (IAU). They were called "dwarf planets."
- Pluto, Ceres, Makemake, Haumea, Eris – these are dwarf planets.
- Ceres is located inside the asteroid belt between the orbits of Mars and Jupiter.
- The other dwarf planets are located in the outer solar system.



TERRESTRIAL AND JOVIAN PLANETS.

The planets in the solar system are divided into terrestrial and jovian planets.

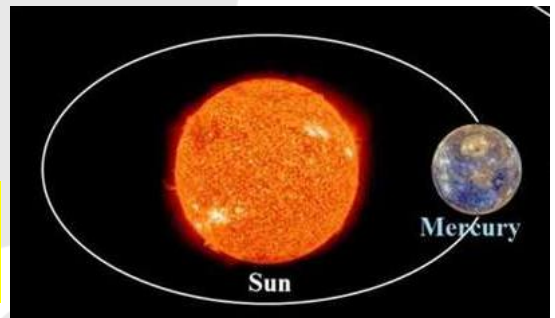


- The terrestrial planets are made of solid surfaces.
- Mercury, Venus, Earth and Mars are the terrestrial planets.
- The jovian planets are made of gaseous surfaces.
- Jupiter, Saturn, Uranus and Neptune are the jovian planets.

MERCURY

- It is the smallest planet in our solar system (Mercury is only slightly larger than Earth's Moon).
- It is nearest to the Sun.
- Due to this much proximity, Mercury's orbit is very much stretched into a long elliptical shape.
- Revolution : 88 Earth Days.
- Rotation : 58.65 Earth Days.
- Mercury has no moons.

From the surface of Mercury, the Sun would appear more than three times as large as it does when viewed from Earth.



- Mercury is a rocky planet, also known as a terrestrial planet. Mercury has a solid, cratered surface, much like the Earth's moon.



MISSION TO MERCURY

NASA's Mercury-orbiting probe, **Messenger**, was launched in 2004.

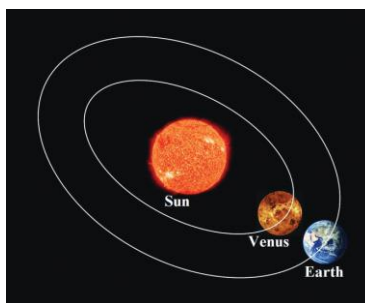
Mariner 10 by NASA in 1973.

- Mercury's most notable surface feature is an ancient crater called the **Caloris Basin**, which is a huge pit for such a small planet.
- On its day side (the side facing the Sun), temperatures reach approx 427°C ; on its night side, the heat escapes through the thin atmosphere, and temperatures plunge to approx -173°C.

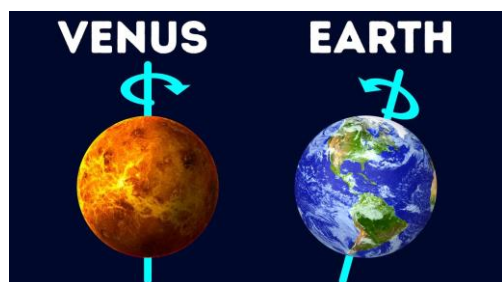
VENUS

It is the second planet from the Sun.
It rotates in the opposite direction (clockwise) to most other planets with its sun rising in the west and setting in the east.

Venus does not have any moons.



Shukrayaan-1 (2024) is a proposed orbiter to Venus by the Indian Space Research Organisation (ISRO) to study the surface and atmosphere of Venus.



- Rotation : 243 Earth Days.
- Slowest rotation in the solar system.
- Revolution : 224.7 Earth Days.

- Venus is by far the **hottest planet** in the Solar System, even though Mercury is closer to the Sun. This is because of the greenhouse effect arising from high concentrations of CO₂ and thick atmosphere.
- Venus is the **brightest planet** in the solar system.
- Venus is sometimes called Earth's **sister planet** or **Earth's twin** because of their similar size, mass, proximity to the Sun and presence of similar physical features such as high plateaus, folded mountain belts, numerous volcanoes, etc.
- Venus was often referred to as the **morning star** and **evening star**.



EARTH

- Earth is the fifth largest planet in the solar system.
- It is the only world in our solar system with liquid water on the surface.
- Earth is the biggest of the four planets closest to the Sun.
- Shape: Geoid
- Rotation : 23 hours 56 min 4 sec
- Revolution : 365 days 5 hours 48 min 46 sec
- Average distance from the sun: 149.8 million km
- Time taken by the light of the sun to reach Earth: 8 min 18 sec



MOON

- It is the only natural satellite of the planet Earth.
- It is the fifth largest natural satellite in the Solar System.
- It is about **385000/384,400** km away from the Earth.
- Only one side of the moon is visible to us on the earth.
- Rotational time: **27 days 7 hours 43 min 11.47 sec**
- **Highest point on the Moon : Mt Leibnitz (approx. 35,000 ft.) situated on the South Pole of the moon.**



Neil Armstrong was the first, and **Buzz Aldrin** was the second to step on the surface of the moon on **July, 1969 (Apollo 11 mission)**.

- **Super Moon**

- Also called perigee moon, it occurs when the moon is nearest the earth. It appears 30% larger.

- **Blue Moon**

- It is the occurrence of two full moon events in a month. Next will take place in 2015 and 2018.

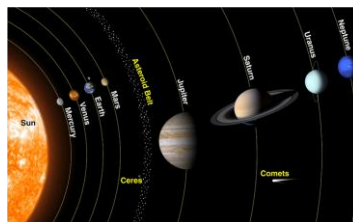
MARS

- Mars is often referred to as the “Red Planet” because of the reddish iron oxide prevalent on its surface.
- Rotation : About 24 hours 37 minutes
- Revolution : 687 Earth Days.
- Mars has two irregularly shaped moons, Phobos and Deimos.
- Deimos is the smallest satellite of solar system.
- Olympus Mons (shield volcano), the largest volcano and the highest known mountain in the Solar System, and of Valles Marineris, one of the largest canyons in the Solar System are located on Mars.



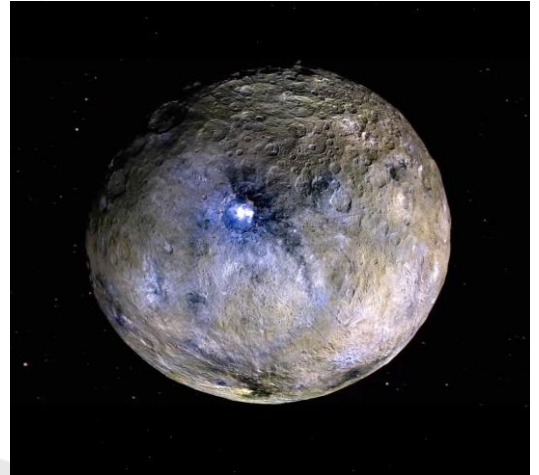
ASTEROID BELT

- Asteroid Belt objects are made of rock and stone.
- The Asteroid Belt contains billions and billions of asteroids.
- Some asteroids in the Belt are quite large, but most range in size down to pebbles.
- Gravitational influences can move asteroids out of the Belt.



CERES

- It is located in the asteroid belt between the orbits of Mars and Jupiter.
- It was first spotted by astronomers in 1801, was first called a planet and later an asteroid. In 2006 it was reclassified as a dwarf planet.
- Ceres is the closest dwarf planet to Earth.
- Ceres is the closest dwarf planet to the Sun and the only one located in the inner solar system. It's the smallest of the known dwarf planets at 950 km (590 mi) in diameter.



JUPITER

- It is the largest planet in the solar system.
- Rotation : About 9.8 hours (Fastest rotation)
- Revolution : 12 Earth years
- Jupiter is called “the Lord of the Heavens”.



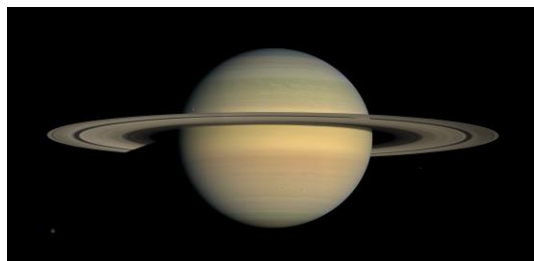
- Jupiter's familiar stripes and swirls are actually cold, windy clouds of ammonia and water, floating in an atmosphere of hydrogen and helium.
- Jupiter's iconic Great Red Spot is a giant storm bigger than Earth that has raged for hundreds of years.



- Jupiter has more than 79 moons.
- The planet Jupiter's four largest moons are called the **Galilean satellites** after Italian astronomer Galileo Galilei, who first observed them in 1610. These large moons are named Io, Europa, Ganymede, and Callisto.
- Io is the most volcanically active body in the solar system.
- Ganymede is the largest moon in the solar system.
- Has an extremely low density as compared to earth 1.3g

SATURN

- It is the second largest planet in our solar system.
- Adorned with thousands of beautiful ringlets, Saturn is unique among the planets. But the other three giant planets (Jupiter, Uranus, and Neptune) also have ring systems.
- Revolution : 29 Earth years.
- Rotation : About 10.7 Earth hours.
- Saturn has 82 moons.
- Titan is the largest moon of Saturn.
- Titan is the second-largest moon in the Solar System.



- Phoebe is the satellite that revolves in the opposite direction as that of Saturn.
- This planet has the least density in the entire solar system

URANUS

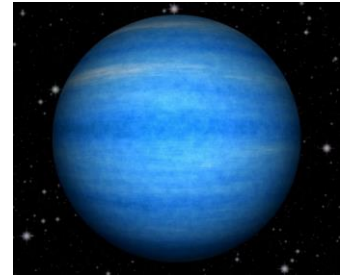
- Uranus is an Ice Giant planet and nearly four times larger than Earth.
- Revolution : About 84 Earth years.
- Rotation : About 17 Earth hours.
- Uranus has 27 known moons
- Like Saturn, Jupiter and Neptune, Uranus is a ringed planet.
- Uranus was discovered in 1781 by William Herschel.
- Uranus is the only giant planet whose equator is nearly at right angles to its orbit.
- It seems to rotate from north to south as it is inclined at an angle of 98° to its orbit.
- Uranus is known as the “sideways planet” because it rotates on its side.
- Uranus gets its blue-green color from methane gas in the atmosphere.
- Uranus was the first planet found using a telescope.



- It has a tremendous tilt and hence is called the ‘lying planet’.
- Just like Venus it also makes a clockwise revolution around the sun.
- It contains 5 rings around it like Saturn. They are called alpha, beta, gamma, theta and epsilon.
- There are various gases present in its atmosphere, therefore it is also known as Green Planet.

NEPTUNE

- It is the most distant planet in our solar system.
- Revolution : 165 Earth years.
- Rotation : 16 Earth hours.
- It has 14 known moons.
- Johann Galle discovered the planet in 1846.



MAKEMAKE

Makemake was discovered in 2005.

Makemake has one provisional moon, S/2015 (136472) 1 and nicknamed MK 2.

HAUMEA

- Haumea was discovered in 2003.

ERIS

- Eris, the largest dwarf planet, is only slightly bigger than Pluto. Discovered in 2003.
- Eris is the furthest dwarf planet from the Sun
- Eris is located beyond the orbit of Neptune and beyond the Kuiper belt in a region known as the "**scattered disc**".



PLUTO

- Pluto was discovered in 1930
- Claude Tombaugh
- Pluto has five known moons. They are :
 1. Charon
 2. Nix
 3. Hydra
 4. Kerberos
 5. Styx
- Pluto has been given the number 134340.



PLANETS ACCORDING TO THEIR SIZE (DECREASING ORDER)

- 1. Jupiter
- 2. Saturn
- 3. Uranus
- 4. Neptune
- 5. Earth
- 6. Venus
- 7. Mars
- 8. Mercury

Facts about the solar system

- **Highest no of satellites**

- Saturn

- **Biggest Satellite**

- Ganymede (Jupiter).

Lunar Mission

- Chandrayaan-1, an Orbiter mission launched in October 2008.
- Chandrayaan-1, ISRO's first exploratory mission to moon, was designed to just orbit the Moon and make observations with instruments on board.
- 22 July 2019, GSLV MK III M1 on its first operational flight successfully launched Chandrayaan-2.
- Lander (Vikram) will remain stationary after touching down, will mainly study the moon's atmosphere. It will also look out for seismic activity.
- Rover (Pragyan): Once on the Moon, the Rover, a six-wheeled solar-powered vehicle, will detach itself and slowly crawl on the surface, making observations and collecting data.

Other Mission

- Mangalyaan-1 was launched in November 2013 and entered the Martian orbit in September 2014. Designed to work for six months, the mission is in its seventh year now.
- ISRO plans to send three humans to space by 2022 under the Gaganyaan (human space) mission.
- Under Chandrayaan-3, ISRO will once again try to land a rover on the Moon. The mission was to be launched late last year.
- Mangalyaan-2 will be an orbiter mission: ISRO chief K Sivan

Questions

Which of the following part of the Sun is visible to humans?

- A. Photosphere
- B. Corona
- C. Chromospheres
- D. Core

Which of the following part of the Sun is visible at the time of the eclipse?

- A. Photosphere
- B. Corona
- C. Chromosphere
- D. Core

Select the correct chronology of the planet according to its size?

I. Mercury

II. Mars

III. Venus

IV. Earth

Code:

- A. IV, III, II, I
- B. I, III, II, IV
- C. I, II, III, IV
- D. IV, I, III, II

Which of the following planets in the Solar System takes the shortest revolution?

- A. Neptune
- B. Mars
- C. Mercury
- D. Venus

Which planet in the Solar System has the highest density?

- A. Earth
- B. Uranus
- C. Neptune
- D. Jupiter

- What is the gap between the orbit of mars and Jupiter called?
 - a. Asteroids
 - b. Comets
 - c. Meteor
 - d. Meteorite

Question	Answer
1	A
2	B
3	A
4	C
5	A
6	a

Parcham Classes